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Special Scientific Report No. 40

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by

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Issued March 1947

Washington, D. C.

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The true value of a fishery must be represented by its contribution to the wealth of the nation. This does not mean merely the profit to the individual fisherman but all actual benefits "to whomsoever they may accrue." This is the language set forth by the Congress to guide the Corps of Engineers in estimating the value of the benefits which, compared with the costs, determine the economic feasibility of flood control and other engineering projects. Because fishery values often assume considerable weight in determining the feasibility or nonfeasibility of engineering projects, it is important that the basis of evaluation be comparable with the bases used in determining other benefits or losses.

In addition to the directly calculable benefits there are many other benefits, usually classed as "intangible." These are usually intangible, however, only in the sense that they cannot be easily translated into terms of dollars and cents. What value, for instance, should be assigned to the fisheries for providing a large body of the best seamen obtainable in a time of national emergency. Many other countries recognize this as a great national benefit and provide subsidies to their fisheries to encourage their welfare and growth.

In determining the loss to a fishery area that may be caused by any specific project, it is very difficult to determine the extra loss, in addition to that portion of a specific fishery that is damaged or destroyed that may be caused to the whole fishery of the respective area by lack of sufficient volume. Such losses, although difficult to evaluate, are nevertheless real.

Although keeping in mind the reality of the so-called intangible benefits, this paper deals only with those values that can be dealt with on a quantitative basis.

Vague statements on the worth of a resource do not constitute a sufficient basis for comparison with other benefits or losses entailed by a project. It is like comparing eggs with potatoes. All values must be reduced to a dollars and cents basis. In doing this, since all values are expressed by prices, one of the first questions that always arises is what price level to adopt. There is the "history always repeats itself" school that insists on using the prices that obtained over a long period of years. However, any reference to the Bureau of Labor Statistics or to the Statistical Abstracts of the United States by the Department of Commerce will show that this is a fallacy. History has not repeated itself. The methods employed in this paper have been evolved so that they are applicable to any price level, but in applying them it is believed that prices of the most recent years--adjusted by analysis of present day economic trends--furnish the best insight to the future.

In line with the methods employed in computing other benefits and losses, we have departed from the indefensible use of the yearly sales value of the fish or its products as a measure of the national benefit. The real benefits must be measured in terms of additions to the national wealth. When all of the actual benefits are computed on an annual basis, they must then be translated into the capitalized value.

When determining the value of a business with an eye to acquiring it, one does not judge it by the size of the gross receipts or by the volume of goods handled. The usual procedure is to first determine the annual earnings. Then, according to the risk involved, the annual earnings are used to determine the fair value that should be paid for a business producing such annual earnings. This fair value is the capitalized value of the business.

The determination of this capitalized value is the final objective of this paper. All discussions of capitalized value invoke the query as to the rate of interest on the capitalized value that should be represented by the annual earnings. This varies from rates as high as 20 to 15 percent for businesses involving considerable risk to 10 to 6 percent for more stable enterprises. In computing national benefits, especially those derived from a public resource which is conserved by the taxpayers' money, low interest rates are applicable. In computing benefits from engineering projects the Corps of Engineers uses only 4 percent. As the life of engineering projects is usually amortized on a 40 to 60 year basis, whereas fishery resources have no foreseeable end, the use of a four percent rate is considered as conservative and has been followed in this paper.

Fisheries may be roughly classified into two main categories, sport and commercial. The calculation of benefits for the sports fisheries is the more difficult but will be more easily understood by following the methods employed for the commercial which is treated first.

The national benefits from the commercial fisheries consist of (1) earnings of the fisheries(before income taxes), (2) taxes paid to state, county, and local communities, (3) earnings by other industries from goods or services furnished to the fisheries. These three classes of benefits must be computed for each level of the industry, i. e., producer, processor and/or wholesaler, and retailer. Because records of the price paid to the producer are nearly always available, we have computed all benefits as a percentage of this price. This makes it simple to compute benefits at different price levels or to combine all benefits on the different production and distribution levels as a ratio of the producer's price.

In determining earnings at the producer level, it is fundamental that unlike the worker in many industries, the fisherman is, with rare exceptions, an entrepreneur, or joint venturer, with the owner of the vessel or gear. Often he owns the vessel or gear himself. In practice the vessel owner receives a certain share of the proceeds from sales from which he pays for the upkeep and depreciation of the vessel and certain other expenses. The remainder represents his earnings. From the rest of the proceeds the crew on a fishing vessel pays for certain other expenses, usually including ice, fuel and food. The remainder is divided into shares and represents earnings; the share that the individual fisherman receives is his earning.

Realizing the need for accurate information on the economics of the fishing industry, the Fish and Wildlife Service, in cooperation with the Federal Trade Commission, in 1944, secured records of costs and earnings at various levels of the industry and for different types of fishing throughout the United States. Because of the great diversity of the industry it was possible to secure only a limited sample for each fishery, but the information constitutes the only accurate source of information available and as such is invaluable. Summaries of the direct national benefits at the various levels from these data are presented in Tables 1 to 4.

It will be noted that the information given is hardly sufficient as a basis for evaluation of any particular fishery, but it does show something of the range of benefits, and it yields a general average that is the best figure available until more data have been collected and analyzed.

On a general countrywide basis the total national benefit from a commercial fishery would typically be computed as follows: the sum of the benefits at each of the four levels, viz.,71.16, 11.23, 6.46 and 15.54, expressed as a percent of ex-vessel price, would be added. They total 104.39 precent. The average annual ex-vessel value of the fishery multiplied by 104.39 percent would give the average annual national benefit. This annual benefit multiplied by 25 (allowing an interest rate of 4 percent) would yield the total capitalized benefit from the fishery.

Table 1.--National benefits from fisheries at the producer level as percent of ex-vessel price

Area and Gear	Years covered	Number of vessels	Earnings: Vessel owners profit before income taxes	Earnings: Fishermen's shares minus joint expenses	Earnings: Total earnings	Taxes[1] before earnings	Profits[2] to allied industries	Total National benefits
New England								
Otter trawl	1941-43	9	7.6	57.5	65.1	0.45	2.69	68.24
Sink gill net	"	2	27.9	50.0	77.9	0.26	1.70	79.86
Traps (groundfish)	"	2	24.5	48.6	73.1	1.67	1.74	76.51
Herring stop nets	"	8	7.6	66.7	74.3	--	4/ 1.78	76.08
Pacific Coast								
Troll, Salmon and albacore	"	2	36.6	27.7	64.3	0.05	4/ 2.47	66.82
Tuna, live bait clipper	"	2	25.2	40.5	65.7	0.57	1.75	68.02
Line trawl halibut	"	3	9.4	69.7	79.1	--	4/ 1.45	80.55
Purse seine:								
salmon	"	1	24.9	59.9	84.8	1.27	4/ 0.96	87.03
tuna	1942-44	4	20.1	52.8	72.9	3/ 0.71	4/ 1.82	75.43
herring	1941-43	1-2	15.6	49.4	65.0	--	4/ 2.42	67.42
sardines	1942-44	3	25.2	55.6	80.8	0.74	4/ 1.28	82.82
mackerel	"	3	17.3	66.2	83.5	3/ 0.71	4/ 1.09	85.30
Otter trawl	1941-43	3	10.7	58.5	69.2	--	4/ 2.13	71.33
Great Lakes								
Gill Net	"	3-4	34.5	39.4	73.9	3/ 0.71	4/ 1.76	76.37
Trap Net	"	2	25.3	20.2	45.5	3/ 0.71	4/ 3.72	49.93

Table 1.--National benefits from fisheries at the producer level as percent of ex-vessel price (cont'd)

Area and Gear	Years covered	Number of vessels	Earnings: Vessel owners profit before income taxes	Earnings: Fishermen's shares minus joint expenses	Earnings: Total earnings	Taxes 1/ before earnings	Profits 2/ to allied industries	Total national benefits
Gulf of Mexico	1941-43							
Dragger, shrimp	"	2	7.4	41.4	48.8	3/ 0.71	4/ 3.49	53.00
Hand line	"	2	-4.1	43.5	39.4	3/ 0.71	4/ 4.15	44.26
Middle Atlantic								
Dragger	"	3	26.4	43.5	69.9	--	4/ 2.08	71.98
Unweighted average								71.16

1/ These do not include social security taxes.
2/ Estimated conservatively as ten percent of expenditures for food, fuel, ice, gear, supplies, repairs and overhauling.
3/ Tax data unavailable, estimated from other fisheries.
4/ Expenditures estimated at 69 percent of receipts remaining after deducting earnings and taxes as in four fisheries calculated in detail.

Table 2.--National benefits from fisheries at the primary wholesaler level as percent of ex-vessel price 1/

Area	Number of firms	Earnings			Profits to allied industries 2/	Total national benefits
		Managerial salaries	Profit before income taxes	Total earnings		
New England	2	1.09	1.58	2.69	1.05	3.74
Middle Atlantic	4	6.63	2.21	8.84	2.58	11.42
South Atlantic and Gulf	3	5.96	15.16	21.12	1.84	22.96
Great Lakes and Inland	3	3.98	2.73	6.71	0.80	7.51
Pacific Coast	3-4	4.59	4.91	9.50	1.04	10.54
Unweighted average						11.23

1/ Data for years 1941, 1942, and 1943.

2/ Estimated conservatively as ten percent of expenditures for supplies and services other than labor.

Table 3--National Benefits from fisheries at the secondary wholesaler level as percent of ex-vessel price. 1/

AREA	Number of firms	Profit before income taxes	Profits to allied industries	Total National benefits
New England	5	8.82	1.34	10.16
Middle Atlantic	1-2	2.19	0.87	3.06
Great Lakes and Inland	16-17	5.21	0.95	6.16
Unweighted average				6.46

1/ Data for years 1941, 1942, and 1943.

Table 4--National benefits from fisheries at the retailer level as percent of ex-vessel prices. 1/

AREA	Number of firms	Profits before income taxes	Profits to allied industries	Total national benefits
New England	2	10.19	3.31	13.50
Great Lakes and Inland	2	15.95	1.63	17.58
Unweighted average				15.54

1/ Data for years 1941, 1942 and 1943.

Of course there is considerable variation between fisheries, so that the national average might often yield results too high or too low for any individual fishery. This is especially true of the species used largely for canning.

In computing, for instance, the national benefits from salmon at the canning level a cost analysis shows that in the Puget Sound and Columbia River areas about 65 percent of the selling cost is represented by the cost of the raw fish. Translating profits from canning (before income taxes) for a number of companies for the 5-year period from 1940 to 1944 into profit in terms of the ex-vessel price of raw fish shows an average benefit in these terms of 26.23 percent. In addition the salaries of corporation officers should be added to these earnings. These salaries on a national average for 214 fish-canning establishments with 190 salaried officers were 1.17 percent of the sale value in 1939. 1/ This 1.17 percent represents 2.36 percent of the raw fish. As the costs of raw fish and labor represent a large share of the selling price, the benefits to allied industries will be small. However, even if we ignore both this benefit and the local taxes paid on the packing establishments, there is still a benefit at the canning level of 28.59 percent of the ex-vessel price.

Thus the minimum national benefits from the canning portion of the salmon fisheries can be estimated by adding the benefits at each level. From the data on hand (admittedly not sufficient for accurate analysis) the benefits from purse-seine caught salmon would be derived by adding 87.03, 28.59, and 15.54 to make a total of 131.16 percent of the ex-vessel price.

The quantitative evaluation of the sport fisheries has been the subject of much confused thinking. In both sport and commercial fisheries, the fish, before capture, are public property. In both instances money is spent in their capture; in both cases profits accrue to the fisherman; taxes and fees accrue to the state and other public agencies, and profits flow into allied industries. The sportsman takes the place of the commercial fisherman in the prosecution of the fishery. However, this factor poses no difficulty in evaluation.

Perhaps the chief difference lies in the motivation of the two fisheries, one for monetary profit, and the other for the advantages derived from recreation. Too often an attempt is made to evaluate the sport fisheries wholly on the basis of the money spent per pound in capturing the fish. This is obviously faulty; you do not create wealth merely by spending. The true measure of the benefit to the individual sportsman is not what he spends but the value of the recreation obtained.

1/ 1942 U. S. Bureau of the Census. Canned fish, crustacea, and molluscs. Reports by Industries, Groups 1 to 10, Manfactures 1939, Volume II, part I, 16th Census of the United States, 1940, pp.105-107, Washington.

The national benefits from sport fishing may thus be summarized as follows:

1. Recreational profit. (Value of the recreation obtained minus cost.)
2. Value of the catch as a foodstuff.
3. Earnings of industry on money spent by the sportsman.
4. Tax revenues (fishing licenses, excise tax on tackle, etc.).

The value to society of the recreation obtained by the sportsman cannot properly be deduced from the amount of money spent by him. Thus a costly trip to a distant fishing locality may yield no more recreation than a less expensive trip to a nearby lake or stream. Neither can the value of the recreation obtained be closely linked with the quantity of fish taken, as the recreational benefit may be just as great when moderate catches are made as when the sportsman takes his limit.

Logically, the recreational advantage is chiefly a function of the amount of time spent in fishing; it clearly has little relation to spending. This means that we must seek an objective method for evaluating recreation that does not depend upon either cost or catch.

The lack of such an independent index of recreational value has been the chief stumbling block in obtaining a monetary evaluation of sport fishing. However, in recent years, the value to society of recreation, apart from the industries it supports, has become well recognized as an important factor in national health, efficiency and morale.

One measure of the value of recreation can be obtained from studies of the increased quality and quantity of output by industrial workers following vacation periods. Such values are benefits even if there is no easy method of placing a value on the freshness of outlook and increased clarity of thought that are often important factors in industrial progress, especially at the supervisory and managerial levels.

The health value of actual participation in outdoor recreation (as opposed to mere spectator participation) has long been acknowledged by the medical profession. Again, we are confronted with the difficulty of monetary evaluation of the prolongation of human life, the savings of medical expense and increased efficiency from improved health.

Because of the practical difficulties of obtaining a valid monetary evaluation of recreational benefit, a method of determining sport fishing benefits is suggested that employs results obtained from the commercial fisheries.

The application of this method to a single day of fishing by a sport fisherman is illustrated as follows:

Data used:

Expenditure by sport fisherman	$10.00
License fee	$ 5.00
Average number of days license used per year	10 days
Weight of fish caught	5 pounds
Retail price of same or equivalent fish per lb.	$0.50

Calculations:

1. Recreational benefit.

Addition of the unweighted average profits at different levels for the commercial fisheries, yields an average profit on the ex-vessel price of 42.9 percent (earnings of the fisherman are omitted in the case of the sport fisherman). As 78.9 percent of the ex-vessel price is cost (including fishermen's earnings) the 42.9 percent of accumulated profits on the ex-vessel price represents 54.4 percent of the cost. Therefore, accounted for on the same basis as the profit to the commercial fishery related to the cost, the recreational benefit to the sport fishermen above would be 54.4 percent of $10.00 or $5.44.

2. Value of the catch as foodstuff.

This is five times $0.50 or $2.50.

3. Earnings of industry on money spent by the sport fisherman.

In the commercial fisheries this amounted (unweighted average) to 7.2 percent of the ex-vessel price. Based on a cost of 78.9 percent of the ex-vessel price, the earnings were 9.1 percent of the cost. Therefore this item is .091 times $10.00 or $0.91.

4. Tax and fee revenues.

The annual license fee divided by the 10 days fished equals $0.51, which is the tax benefit for the day of fishing.

Summary:

1. Recreational benefit	$5.44
2. Foodstuff value of catch	2.50
3. Earnings of industry on expenditure	.91
4. Tax revenue	.50
Total national benefit	$9.35

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